CA-IR-15

**Ref: T-4, Page 33.**

"If the two lines providing power to the Pukele substation were both out of service, 93% of the customers serviced from the Pukele Substation would incur an outage. Most of our customers . . . would be out of power until one of the two 138 kV transmission lines could be restored to service."

a. How long has the Pukele Substation been operated in the manner in which the loss of both 138 kV transmission lines will result in the outage of 93% of customers serviced by Pukele Substation?

b. Why have the other sub-transmission or distribution projects not been previously proposed or implemented (such as the 46 kV project proposed in the instant docket) to provide backup to Pukele Substation loads?

c. Besides loads fed from the Pukele substation, are there other load areas that do not have at least two 46 kV sources from different substations? Provide copies of all documentation and/or analysis to support the response.

d. If other load areas do not have at least two 46 kV sources from separate substations, please characterize these loads (i.e., provide geographical description of the loads, approximate MW of loads, and importance of loads to HECO in terms of residential versus commercial).

HECO Response:

a. The Pukele Substation was installed in 1964 with two 138kV transmission lines feeding the substation. The Pukele Substation has always operated with the possibility of losing both 138kV transmission lines, which would lead to loss of service to customers, although the percentage of customers experiencing an outage would have varied over time depending on how the 46kV system was configured.

b. HECO has been taking steps on the 46kV sub-transmission system to address the Pukele Substation Reliability Concern. As stated in HECO T-4, page 44, some of the customers that were previously served by the Pukele Substation have been moved to the Archer Substation, where these transferred customer would not experience a loss of service if the

two 138V feeds to the Pukele Substation were out of service. Also stated on HECO T-4, page 44, is that this practice of transferring loads from the Pukele Substation is limited by the existing 46kV system and is already reaching its limitation without additional transmission and/or sub-transmission facilities. The Kamoku 46kV Underground Alternative – Expanded would provide additional facilities to shift approximately 80 MW of load to the Downtown Substations to further decrease the amount of customers affected by the loss of the two 138kV feeds to the Pukele Substation. In addition, in 1994, HECO segmented the two Koolau-Pukele 138kV transmission lines into shorter lines. Longer lines are more exposed to fault conditions, and under the old substation configuration, faults on the Koolau bus would result in having to de-energize one of the two Pukele Substation feeds, depending on the location of the fault on the Koolau bus. See HECO T-4, pages 44-45.

c. Yes. For example:

1) Tripler Hospital, which has both 46kV feeds from the Halawa Substation,
2) Sand Island, which has both 46kV feeds from the Iwilei Substation,
3) Customers served from the Kewalo Distribution Substation, which has two 46kV feeds from the Archer Substation,
4) Customers served from the Wiliwili Substation, which has two 46kV feeds from the Koolau Substation,
5) Customers served from the Ahi, Kuapa, Kamiloiki, Queens, Keolu, Pohakupu, Kailua, Kalama, Aikahi, Mokapu, Kalaheo, Puohala, Huna, and Kaneohe Substations, each of which has two 46kV feeds from the Koolau Substation.

HECO objects to providing the documentation for the response to subpart c because

of security reasons. The documentation for this response is located on the HECO Switching Diagrams and provides details on how the 46kV is interconnected together. The information can be provided to the Commission and the Division of Consumer Advocacy under an appropriate protective order.

d. Please see the table on pages 4-5 of this response. Out of more than 120 distribution substations, approximately ½ of the substations do not have two 46kV sources from separate transmission substations. 10 of the distribution substations are fed from transmission substations with only two 138kV feeds. The attached table does not include the 46kV substations fed by the Pukele Substation.

| Distribution Substation | Feeder Source | Approximate KVA | Residential/Commercial |
|---|---|---|---|
| Kewalo | Archer | 11300 | Commercial |
| Makaloa | Archer | 20000 | Commercial |
| Portions of Piikoi | Archer | 15400 | Commercial |
| BWS-Ewa Water System | Ewa Nui | 2100 | Commercial |
| Pacific Concrete | Ewa Nui | 2800 | Commercial |
| Tripler | Halawa | 9000 | Hospital/Military |
| Kahili | Halawa | 4000 | Residential |
| Kamoho | Halawa | 4500 | Residential |
| Camp Smith | Halawa | 7600 | Military |
| H3 Halawa | Halawa | 1200 | State |
| Hila | Halawa | 19700 | Residential |
| Portion of Kakaako | Honolulu | 12800 | Commercial |
| Sand Island | Iwilei | 10500 | Commercial |
| Mikilua | Kahe | 17200 | Residential |
| Wailupe | Koolau | 7800 | Residential |
| Wiliwili | Koolau | 4200 | Residential |
| Ahi | Koolau | 16500 | Residential |
| Kuapa | Koolau | 14900 | Residential |
| Kamiloiki | Koolau | 6800 | Residential |
| Queens | Koolau | 3900 | Residential |
| Waimanalo Beach | Koolau | 10200 | Residential |
| Keolu | Koolau | 16800 | Residential |
| Pohakupu | Koolau | 3800 | Residential |
| Kailua | Koolau | 13800 | Residential |
| Kalama | Koolau | 3700 | Residential |
| Aikahi | Koolau | 4700 | Residential |
| Mokapu | Koolau | 20000 | Military |
| Kalaheo | Koolau | 1600 | Residential |
| Huna | Koolau | 3800 | Commercial |
| Puohala | Koolau | 10500 | Residential |
| Kaneohe | Koolau | 29200 | Residential |
| H-3 Haiku Tunnel | Koolau | 900 | State |
| Waihee | Koolau | 13400 | Residential |
| BWS Waihee | Koolau | 1000 | Commercial |
| BWS Punaluu | Koolau | 800 | Commercial |
| Hickam | Makalapa | 27000 | Military |
| Puunui | School Street | 5300 | Residential |
| Pauoa | School Street | 10300 | Residential |
| Fort Street | School Street | 13300 | Commercial |

| Distribution Substation | Feeder Source | Approximate KVA | Residential/Commercial |
|---|---|---|---|
| Kuilima | Wahiawa | 2200 | Residential |
| Wamea | Wahiawa | 4700 | Residential |
| Waialua | Wahiawa | 11000 | Residential |
| Helemano | Wahiawa | 4000 | Residential |
| BWS Wahiawa | Wahiawa | 800 | Commercial |
| BWS Wahiawa Wells #2 | Wahiawa | 500 | Commercial |
| BWS-Mililani Mauka | Wahiawa | 600 | Commercial |
| Geiger | Waiau | 1400 | State |
| Peninsula | Waiau | 3300 | Military |
| West Loch | Waiau | 2100 | Military |
| Waipiolani | Waiau | 11500 | Residential |
| Waimano | Waiau | 18700 | Residential |
| Waimalu | Waiau | 20400 | Residential |
| Kaonohi | Waiau | 17000 | Residential |